



Enzyme Technology In **High Fiber & High Protein Better-for-You Tortillas**

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Classified as General Purpose

High Fiber High Protein Tortilla

Fibers and Protein Challenges

Enzyme Kinetics

Enzymes For Dough Rheology

Enzymes For Freshness/softness



The Better-For-You tortilla is an ongoing trend worth exploring and it does not come without challenges.



+0.5%
5 Year Growth
Units Sold

Fiber claims are a mature space in tortilla and flatbreads.

15% of total units sold have the claim.



Protein claims are **quickly accelerating** since 2022.

The intersection between protein and fiber should gain momentum a fiber regains popularity.



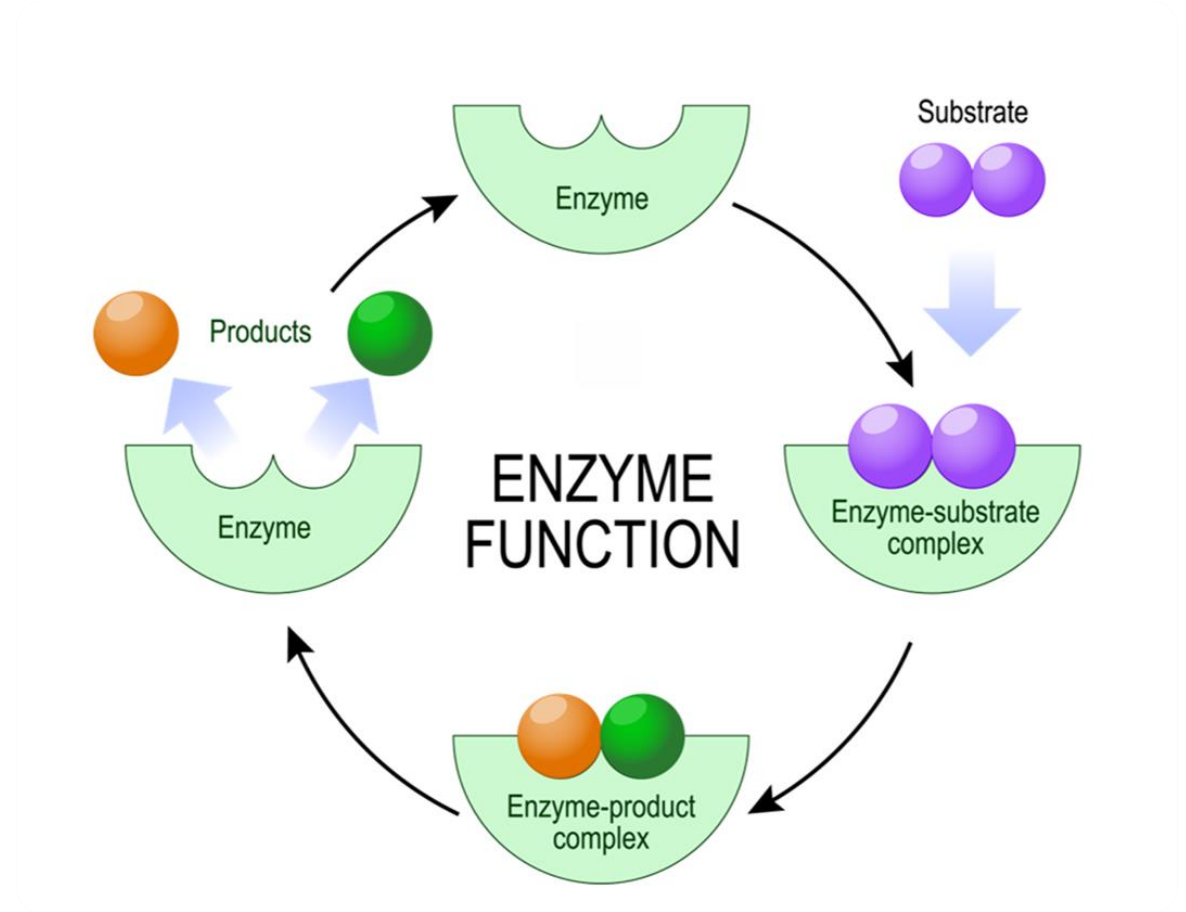
+6%
5-year CAGR
High Protein
Claim Growth
Units Sold

GLP-1
Users have increased protein consumption (plant-based or animal)

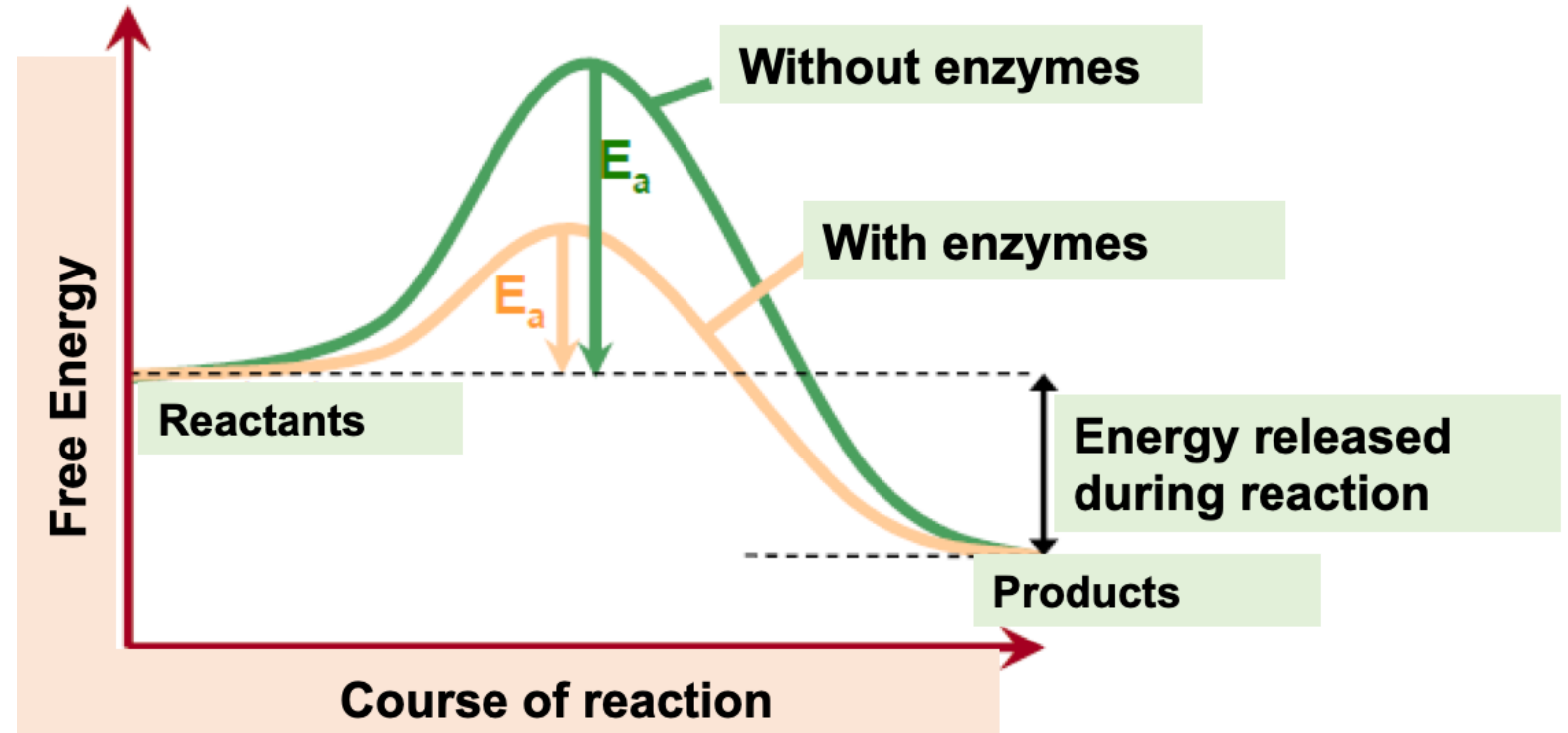
Source: Nielsen. Datassential.

Enzymes

- Proteins, biocatalyst
- Very specific [e.g., substrate, pH, temperature]
- Work under mild conditions
- **Induced Fit Model**
 - Have more one or more active sites
 - Active sites continuously reshape until substrate is completely bound



- Enzymes reduce activation energy
- **Activation energy:** Energy required to make the reaction
- Lower activation energy: Faster the reaction



Reformulate With Enzymes

Affordable Sustainable Nutrition



Raw material flexibility



Reduce energy usage



Reduce water



Reduce production time



Fresher for longer



ENZYMES



Lower production costs



Less Waste



**Better Product,
Better Process,
Better Planet**

Creating high fiber and high protein tortillas involves deep technical knowledge



Processing

- Dry/Hard Dough
- Hydration
- Poor machinability
- Longer Mixing Time



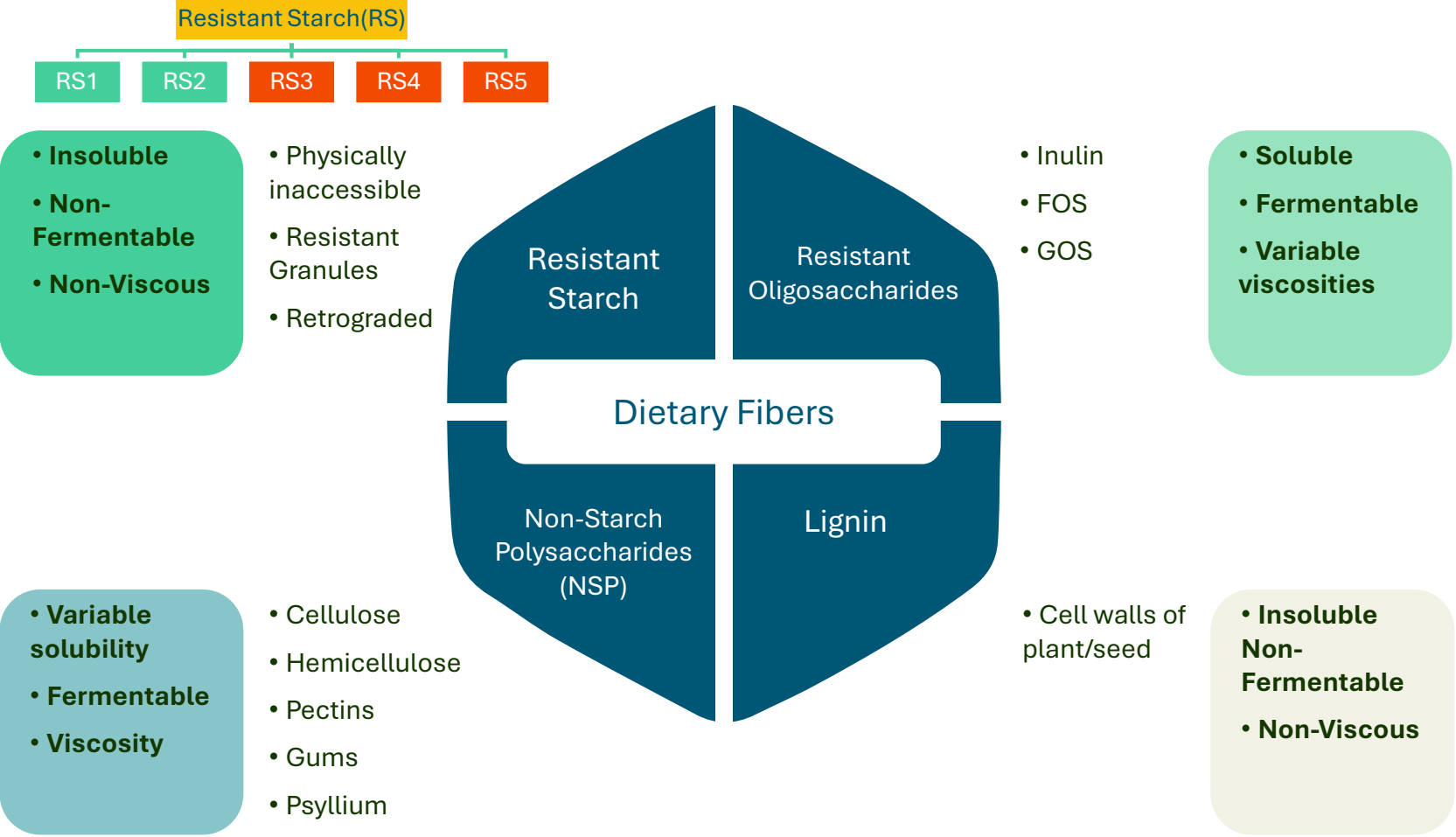
Freshness/Texture

- Dry/Gritty Texture
- Broken edges
- Poor rollability & resilience



Taste

- Off-Taste
- Beany
- Bitter



Types of Proteins

1. Cereal Grains : Wheat, Rice, Oat, barley
2. Legumes: Pea, Faba, Mung, Chickpea
3. Oil Seeds: Soy, Canola, Hemp
4. High Functionality: Engineered Protein
5. Dairy, Egg, Meat: complete, no starch, complex carb or fiber

Challenges

- **Nutritional Quality**
- **Solubility/Hydration**
- **Texture/Dryness**
- **Flavor**

Milk Protein is complete protein 1.0..

Protein Source	PDCAAS Value
Soy Protein Concentrate	0.99
Pea Protein Concentrate	0.73
Lentils	0.51
Whole Wheat	0.40
Wheat Gluten	0.25

Protein Digestibility Corrected Amino Acid Score (PDCAAS)
Digestible Indispensable Amino Acid Scores (DIAAS)

Protein Isolates: ~ > 80% ;
Pea, Chick Pea, Wheat, Soy, Whey

Protein Concentrate: ~ >50%
Pea, Chick Pea, Wheat, Soy, Whey

Protein Flour: ~ >10%
Pea, Chick Pea, Wheat, Soy, Whey

Microbial Protein: ~ 35% + 30% DF
Fungal (Mycoprotein) or Algae

Pea/Lentil starch characteristics are different than wheat starch

What is High Protein & Low Carb Tortilla?

Amount per serving		60
		% Daily Value*
Calories		
Total Fat 3.5g		4%
Saturated Fat 1.5g		8%
Trans Fat 0g		
Polyunsaturated Fat 1.5g		
Monounsaturated Fat 0.5g		
Cholesterol 0mg		0%
Sodium 330mg		14%
Total Carbohydrate 20g		7%
Dietary Fiber 18g		64%
Total Sugars 0g		
Includes 0g Added Sugars		0%
Protein 5g		

Serving Size = 50 g
Net Carb = 2 g
Protein = 5 g
Claim = Low Carb

Amount per serving		90
		% Daily Value*
Calories		
Total Fat 2.5g		3%
Saturated Fat 1g		5%
Trans Fat 0g		
Cholesterol 0mg		0%
Sodium 310mg		13%
Total Carbohydrate 12g		4%
Dietary Fiber 8g		29%
Total Sugars 0g		
Includes 0g Added Sugars		0%
Protein 7g		11%

Serving Size = 50 g
Net Carb = 4 g
Protein = 7 g
Claim = High Protein

Amount per serving		180
		% Daily Value*
Calories		
Total Fat 6g		8%
Saturated Fat 2.5g		13%
Trans Fat 0g		
Cholesterol 0mg		0%
Sodium 440mg		19%
Total Carbohydrate 18g		7%
Dietary Fiber 1g		4%
Total Sugars 1g		
Includes 0g Added Sugars		0%
Protein 11g		

Serving Size = 50 g
Net Carb = 15g
Protein = 10 g
Claim = High Protein

- High fiber tortilla is recognized by “net carb(g)” content
- No legal definition of Net Carb

Net Carb (g) =
Total Carbohydrate (g) - Dietary Fiber (g) - Sugar Alcohol

- High Protein/Protein Source
- 20% of Protein in DV

KERRY

DOUGH RHEOLOGY

Classified as General Business



Nutrition Facts	
8 Servings per container	
Serving Size: 1 slice (43g)	
Amount per serving	
Calories	70
Total Fat 3g 4%	
Saturated Fat 1g 2%	
Trans Fat 0g 0%	
Polyunsaturated Fat 1g 2%	
Monounsaturated Fat 1g 2%	
Cholesterol 0g 0%	
Sodium 320mg 14%	
Total Carbohydrate 15g 7%	
Dietary Fiber 5g 10%	
Total Sugar 5g 10%	
Includes 0g 0%	
Protein 5g 10%	
Vitamin D 0mcg 0%	
Calcium 70mg 6%	
Iron 0.6mg 4%	
Potassium 20mg 0%	

Designing of bulk fiber blend

Insoluble/Soluble/
Large or small size

Selection of proteins/gluten

Gluten with different
hydration levels

Optimization dough reducer

Sodium metabisulfite
to optimize gluten
reduction

Optimal Hydration



Dough Development/
Dough Stability



Optimal Dough Rheology



Dough is the **HEART** of baking!

Step 1: Designing of Bulk Fibers

Hydration Levels

**Insoluble Fibers
(Hemicellulose, Resistant Starch)**



Water Absorption Capacity
Particle Size

Starch @ 58.0 %
Hydration = ~26.4%

**Gluten@ 12 %
Hydration = ~ 31.2%**

Damaged Starch @ 9.2 %
Hydration = ~ 19.1%

**Soluble Fibers
(Guargum, Beta Glucan)**

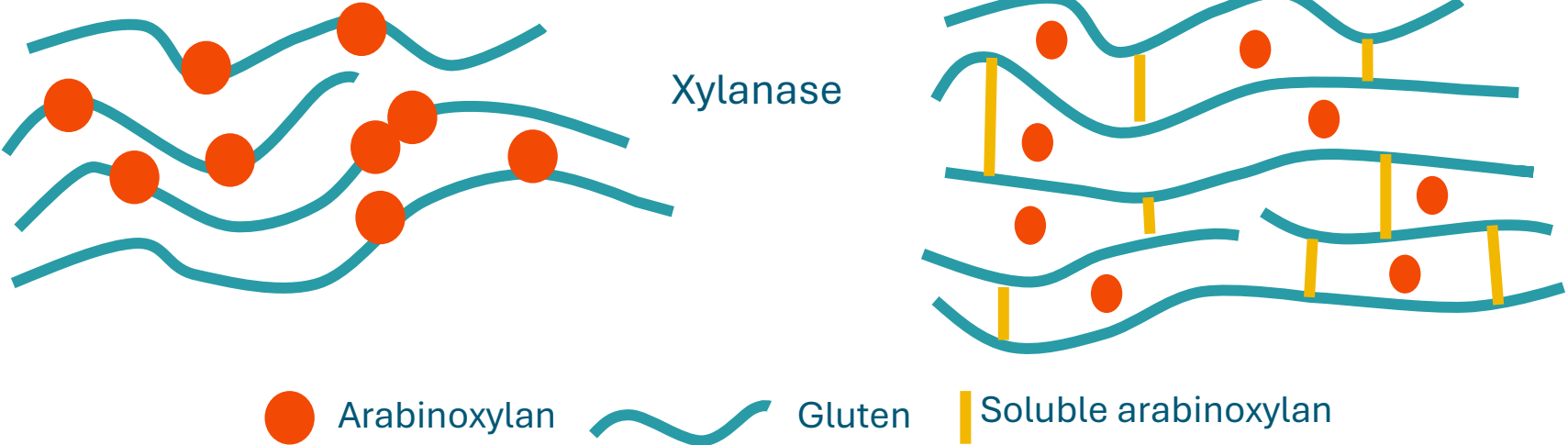


**Soluble Fiber @ 1.5 %
Hydration = ~ 23.4%**

Formulation Challenges: Dough Rheology



Step 3: Arabinoxylan (NSPs) Degrading Enzymes (Xylanases)



EXTENT OF DEGRADATION



Two Kinds of Arabinoxylan in Wheat Flour

25-30% Water Extractable (WE-AX)

70-75% Water Unextractable (WU-AX)



Formulation Challenges: Dough Rheology

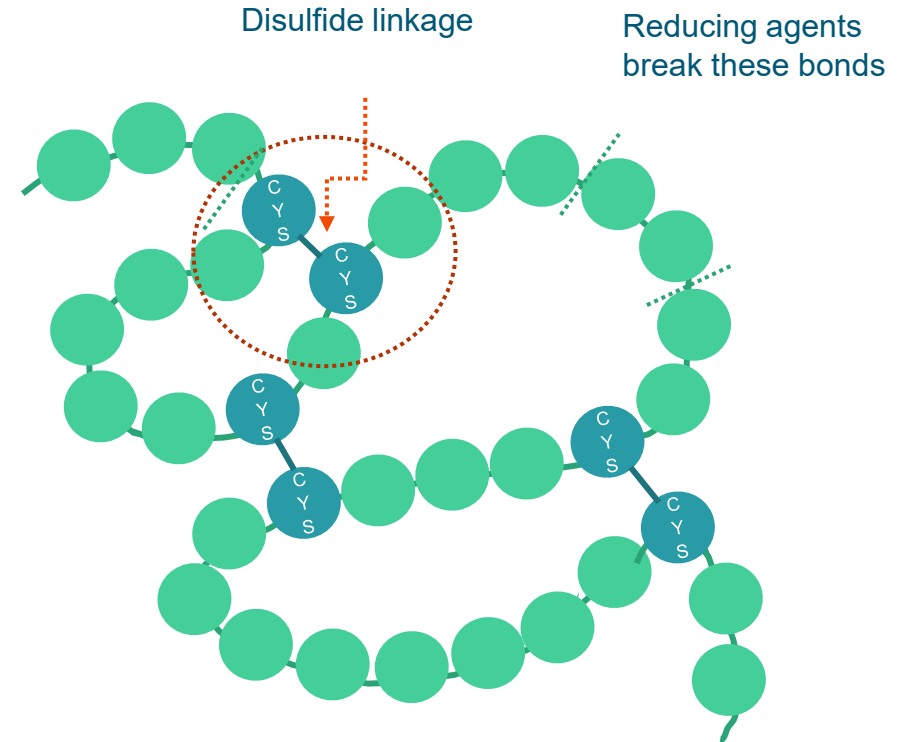
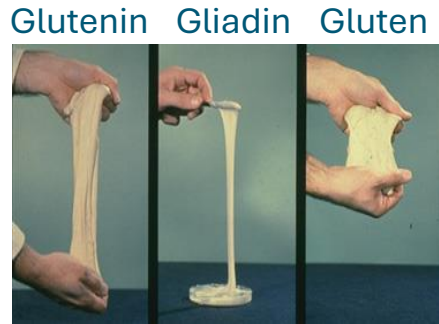
Step 2: Selection of Proteins/Dough Relaxers



Dough Development /Stability



Dough Relaxers- Dough Rheology



Dough Relaxers : Sodium metabisulfite, L-Cysteine, Enzyme system: **Biobake™ BPN**

Weaken the gluten matrix → Create SH- (Sulphydryl group); Strengthen the gluten with SS- (Disulfide linkages)

Reduce dough elasticity, improves water absorption, improves softness, dough machinability, reduce mixing time

Biobake™ BPN

- Process Efficiencies
- Easy Machine Handling
- Minimal Mixing Time
- No Stickiness



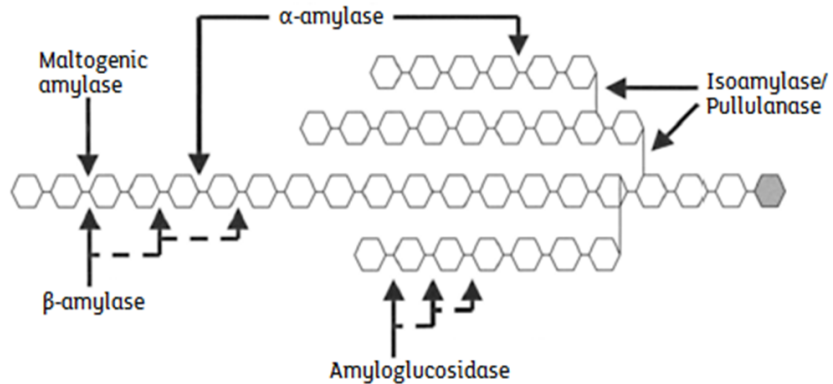
KERRY

TEXTURE

Freshly Baked Experience
From First to Last Bite



Freshly Baked Experience From First to Last Bite



Biobake Fresh Range

(Maltogenic amylase, α -Amylase)

Biobake Range

(Xylanase)

Full range of GM & Non-GM derived enzymes available

Enhance Shelf Life

- Softness
- Flexibility
- Resilience

Improves

DOUGH PROCESSING

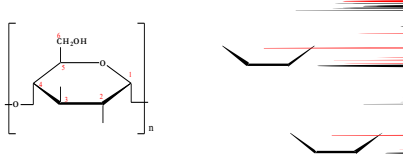
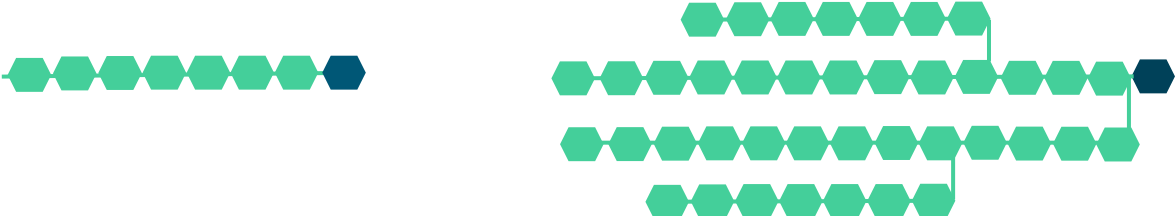
Optimised Dosing

COST-IN-USE

Reformulate For

COST SAVINGS

Starch Gelatinization: Starch Water Interaction



Gelatinization

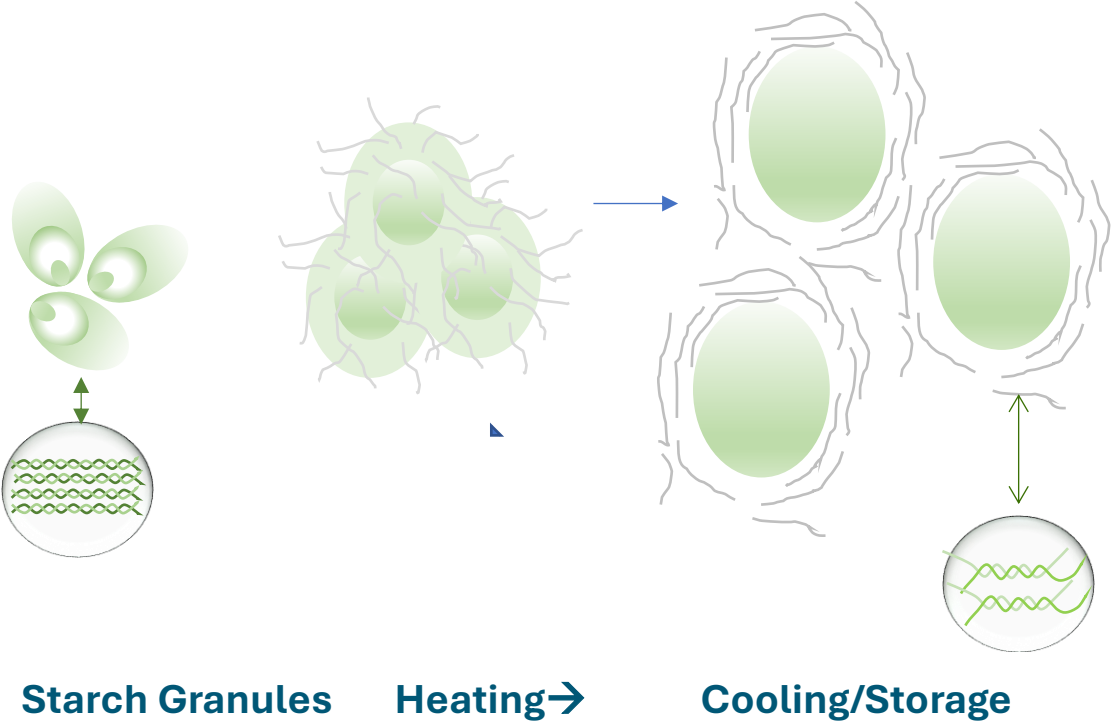
- In the presence of water and heat starch absorb water and swells up; loses its crystalline structure, viscosity increases

Pasting

- Pasting follows gelatinization and involves granular swelling amylose molecule
- Total disruption of starch molecule

Retrogradation

- After gelatinization starch tend to regain its crystalline structure



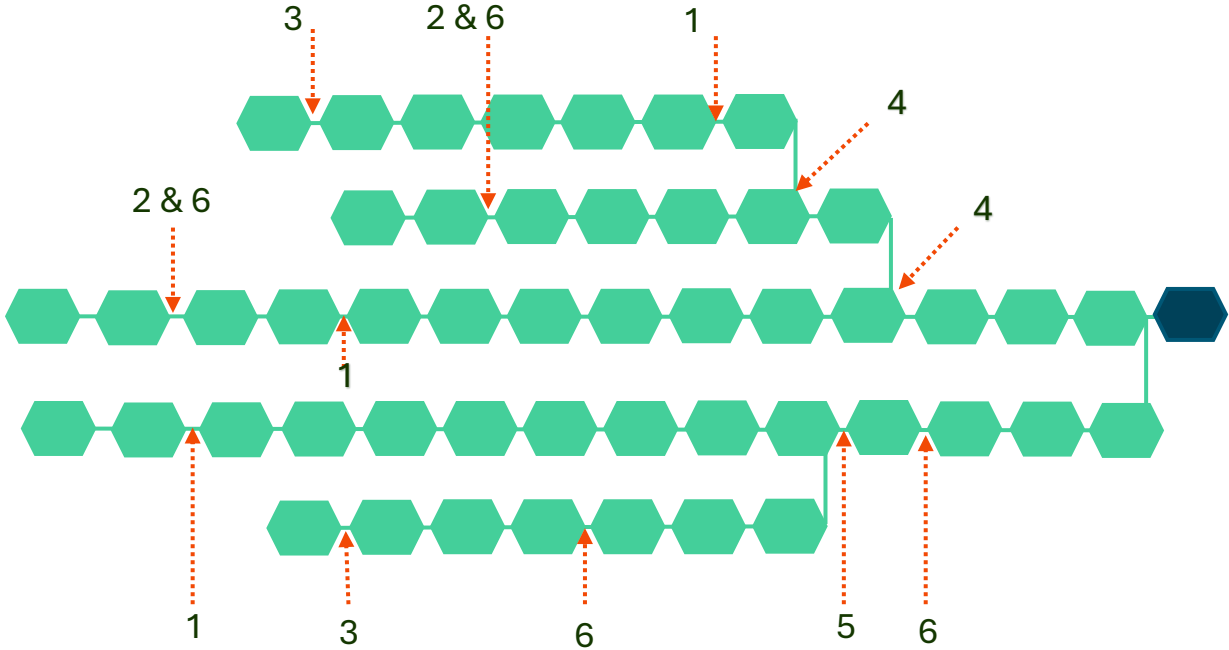
Enzyme : Amylases As Anti-Staling Agents



Oligomers: DP = 2; DP = 3; DP = 4

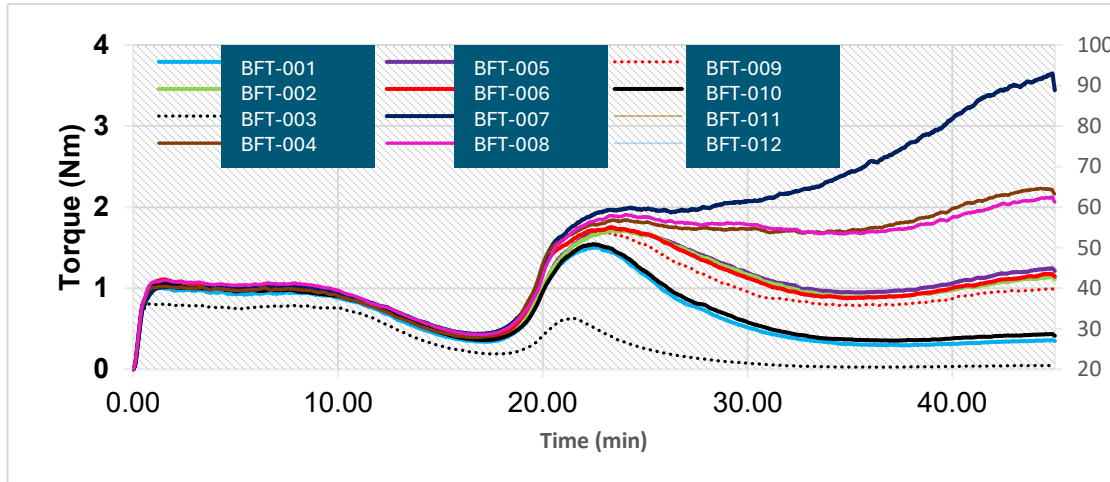


Code	Enzyme
1	α -Amylase
2	β -amylase
3	Amyloglucosidase
4	Pullinase:Isoamylase
5	Maltotetraose (G4) producing amylase
6	Maltogenic Amylase

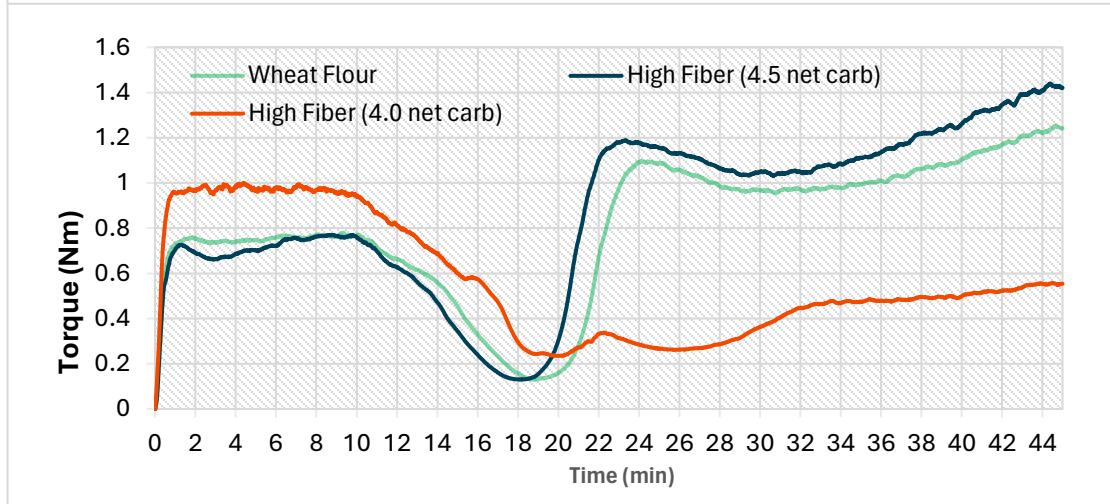


Softness, Flexibility, Resilience

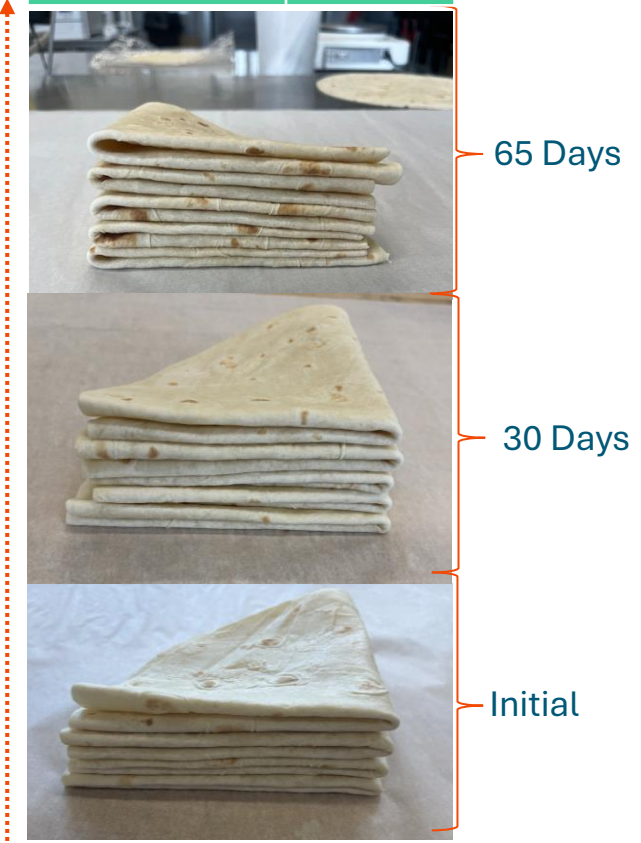
Screening of enzymes For retrogradation



High Fiber/High Protein Tortilla



Serving Size	45 g
Net Carb	4.0 g
Protein	6.0 g



High Fiber Tortilla: Scale-Up Run



BioBake™: Enzyme Technology | ProBake™: Preservation Technology | Myvatex™ Supreme NS: Anti Stick Technology



Serving Size	45 g
Net Carb	4.0 g
Protein	7.0 g



Few Marketed Products




Protein : 7 g
%DV : 11%
Net Carb : 4 g
Serving Size : 50 g
Claim : Protein Plus



Protein : 7 g
%DV : 8%
Net Carb : 2 g
Serving Size : 43 g
Claim : Keto, GLP



Protein : 8 g
%DV : 10%
Net Carb : 5 g
Serving Size : 47 g
Claim : Keto, Good Source of protein



Protein : 11 g
%DV : x
Net Carb : 6 g
Serving Size : 57 g
Claim : High Protein Wrap



Protein : 10 g
%DV : 20%
Net Carb : 2 g
Serving Size : 38 g
Claim : High Protein Tortilla



Protein : 12 g
%DV : xx
Net Carb : 7 g
Serving Size : 57 g
Claim : High Protein Tortilla

Pea Protein

Dairy Protein

Fababean Protein

Design fiber blend (Modified wheat starch, Modified Potato starch) or Design Protein Blend : Wheat Protein, Pea Protein, Chick-Pea Protein

Ingredients	Bakers%	Comments
Wheat Flour	5.0-25.0	Based on desired net carb
Water	50.0-75.0	Based on type of fiber, protein
Oil/Shortenings	10.0-15.0	Based on nutritionals
Fiber Blend	50.0-85.0	Based on claim; choice of fibers
Protein Blend	8.00-35.00	Based on claim; choice of proteins
Dough Relaxer	0.05-0.10	Based on Biobake™ BPN
Tortilla Softener	0.05-0.08	Based on Biobake™ Fresh Tortilla
Antistick Agent	1.00- 1.500	Based on Myvatex™ Supreme NS
Fermented wheat flour	1.00- 2.00	Based on Upgrade™ ProW5
Calcium Propionate	0.75-1.25	Based on shelf-life and claim
Potassium Sorbate	0.25-0.60	Based on shelf-life and claim
Acidulant	0.25-1.00	Based on claim; choice of acidulant
Baking Powder	0.50-1.50	Based on type of tortilla; wrap/burrito or retail



Enzyme Technology In High Fiber & High Protein Better-for-You Tortillas



Key Takeaways:

Selection of
fibers/protein
based on claim



Dough Rheology:
Optimal hydration
Freshness solution



Enzyme System with
multiple enzymes for
optimal performance



KERRY

Performance

BAKED
IN

Come visit us at
Tabletop 322



THANK YOU

Any Questions?

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Discover more at [kerry.com](https://www.kerry.com)